

# **EXHIBIT “E”**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:	)	
	)	
RODNEY M. LAFOLLETTE, ET AL.	)	Docket: 7310
	)	
Serial No.: 09/037,801	)	Art Unit: 1745
	)	
Filed: March 10, 1998	)	Examiner: MARIA NUZZOLILLO
	)	
For: MICROSCOPIC BATTERIES FOR MEMS	)	
SYSTEMS	)	
	)	

**SECOND DECLARATION OF RODNEY M. LAFOLLETTE, PH.D.**

Honorable Commissioner of Patents and Trademarks  
Washington, D.C. 20231

Sir:

I, Rodney M. LaFollette, state as follows:

1. I am a citizen of the United States of America and a resident of the State of Utah.
2. I have earned a Doctorate in Chemical Engineering from the Brigham Young University.
3. My educational and professional resume is of record, being attached as Exhibit "A" to my first Declaration.
4. I have over 12 years of business and educational experience. This experience includes extensive experience in the electric battery field.
5. I am an inventor, either sole or joint, of inventions comprising the subject matter of U.S. patent applications and issued patents. I am a co-inventor of the invention of the above-identified patent application.
6. I have worked extensively in research and development pertaining to electric batteries and am thoroughly familiar with various electric battery, fuel cell and capacitor developments.

7. I have been requested to provide an assessment of the claimed subject matter of the above-identified application in comparison with a certain prior art patent and to provide information concerning the clarity of certain language within the presently pending claims.

8. I consider my skill in the electric battery field to be above ordinary skill.

9. In the course of functioning as indicated above, I received a copy of the above-identified application, as filed.

10. I received also a copy of the Office Action in the above-identified application mailed May 17, 2000, a copy of the patent relied upon by the Examiner in said Office Action, and a copy of the Amendment being filed essentially contemporaneously with this Declaration.

11. I was asked to evaluate the 35 USC § 112, second paragraph and the 35 USC § 103(a) rejections contained within the Office Action.

12. I am familiar with the invention of the above-mentioned application, as originally filed, and the claims as originally filed and as presently constituted, due to the above-mentioned Amendment, because I have studied both. I have also read and studied the patent relied upon in the said Office Action.

13. Elected claims 10-43, 51-54, 89-92 and 94-97, as earlier constituted, were rejected under 35 USC § 103(a) as being unpatentable over Arledge et al. (U.S. 5,437,941, the '941 patent).

14. The problem confronting the inventor of the '941 patent did not concern batteries, but rather capacitors.

15. Moreover, the '941 patent was not concerned with microscopic capacitors, nor with integration of a microscope capacitor for integration with microelectromechanical systems (MEMS) or other microscopic circuits.

16. The '941 patent was concerned only with macroscopic capacitors, not microscopic batteries and not microscopic batteries in combination with microcircuits.

17. The '941 patent does not enable a microscopic battery nor a microscopic battery integrated into microcircuitry.

18. For the reasons set forth above and below, the '941 patent has several significant deficiencies which does not qualify it as a suitable § 102 or § 103 reference.

19. The '941 patent enables only capacitors and does not enable any form of battery.

20. The '941 disclosure does not relate to microscopic-sized batteries. It does not enable microscopic batteries in combination with microcircuitry.

21. An electrolyte in the '941 patent is disclosed as being "optional," which makes the '941 disclosure inapplicable to batteries.

22. While the '941 patent, in its introduction, speaks generally of both capacitors and batteries, only an enabling disclosure for capacitors is provided. The '941 provides no enabling disclosure for a battery. While a capacitor and a battery are both devices which store electrical energy, they are fundamentally different, just as fuel cells and batteries are fundamentally different.

23. The '941 patent discloses only two specific embodiments, i.e., the embodiments of Figures 1 and 3. Both are capacitors and can not function as batteries. This is admitted by the '941 inventor. See Col. 1, line 10, Col. 4, lines 55-57, Col. 5, lines 18, 42, 44, 50 and 52, and the heading of TABLE 1 (Col. 5, line 22).

24. Only because the subject matter of the '941 patent is restricted to capacitors, can the '941 inventor say "use of an electrolyte is optional." See Col. 1, lines 61-62 and Col. 2, lines 30-31.

25. While the '941 inventor states that "a battery can be created," this is entirely speculative and without enablement. Conclusive evidence that the '941 patent is strictly confined to capacitors is found in Figure 4, which depicts the classic behavior of a capacitor, not the behavior of a battery. Just as a fuel cell is not a battery, so too a capacitor is not a battery.

26. In terms of basic technology, a capacitor consists of two solid electrodes, separated from one another, as shown in Figure 1, presented in the Remarks section of the Amendment filed essentially concurrently responsive to the Office Action mailed May 17, 2000. When the material in the intercell gap is dielectric (an electronically insulating material), the capacitor is referred to as an *electrostatic capacitor*. When an electrical potential (voltage) is applied to the device, charges build up on the surfaces of the electrodes, as shown in Figure 2, presented in the Remarks section of the Amendment filed responsive to the Office Action mailed May 17, 2000. Current flows through the cell. The capacitor will remain charged, even when the leads are disconnected (except for leakage currents). The charge consists of an excess or deficiency of electrons in the material on the surface of the electrodes.

27. When a charged capacitor is connected to a resistive load, current flows through the load, such that the capacitor is discharged. Thus, capacitors serve to store electrical energy, by storing electrical charge on the surface of the electrodes. The electrodes themselves remain structurally unchanged and are not reactive during capacitor operation.

28. A special class of capacitors is *electrochemical capacitors*. Electrochemical capacitors have an electrolyte in the intercell gap. An electrolyte contains ionic species. For example, in sulfuric acid, the electrolyte will contain water molecules,  $H^+$  (actually  $H_3O^+$ ) and  $HSO_4^-$ . The electrodes are solid materials. When an electrochemical capacitor is charged, charge builds up on the surface of the electrodes, just as with electrostatic capacitors. However, the charge

consists, not of an excess or deficiency of electrons, but of ions instead, supplied from the electrolyte. When charged, positive ions build up on the surface of one electrode, and negative ions on the opposite electrode.

29. Electrochemical capacitors normally comprise very high surface area electrode materials, such as a metal oxide, carbon, or metals such as nickel. Because of this, they can have much higher energy densities than electrostatic capacitors. The amount of energy stored is proportional to the voltage, in both cases. The maximum voltage that the capacitor can handle is limited by the breakdown limits of the dielectric (for electrostatic capacitors) or the electrolyte (for electrochemical capacitors).

30. While batteries have certain structural similarities to capacitors, energy is stored in the chemical bonds of the electrode materials not on the surface. For example, in lead-acid battery,  $\text{PbO}_2$  is used as a positive electrode material and  $\text{Pb}$  as the negative electrode material. Sulfuric acid serves as the electrolyte. During discharge, the  $\text{PbO}_2$  and  $\text{Pb}$  are both converted to  $\text{PbSO}_4$ , which has less chemical energy than the original materials. The chemical energy that is released is converted to electrical energy, which flows through the load applied to the battery. During charge, the reverse process occurs.

31. The summary difference between batteries and capacitors is that in the capacitor, the *surface processes* are used, while in the battery, *bulk or reactive processes* dominate. In the capacitor, energy is stored in surface charges. In a battery, energy is stored in chemical bonds. Batteries are referred to as “faradaic devices” because they involve faradaic, or charge-transfer chemical reactions. Capacitors are “non-faradaic” devices. Batteries have 1-6 orders of magnitude more energy storage capability than capacitors. Capacitors usually have much higher power capabilities.

32. The '941 patent describes capacitors which are not microscopic in area, but rather are microscopic in area. See Col. 5, lines 3-5 of the '941 patent which states "total area . . . was approximately 20 square centimeter." Compare this with a typical or representative footprint area of the present invention of "0.1cm<sup>2</sup> down to 0.0001cm<sup>2</sup>." See page 15, line 3 of the present application. Thus, even as to capacitors, the '941 patent is not enabling of a capacitor having a microscopic area (or a microscopic volume).

33. In this regard, I understand case law eliminates the '941 patent as a reference. For example, see In re Payne, Durden and Weiden, 203 USPQ 245, 255 (CCPA 1979), which holds:

References relied upon to support a rejection under 35 USC 103 must provide an enabling disclosure, i.e., they must place the claimed invention in the possession of the public. In re Brown, 51 CCPA 1254, 1259, 329 F.2d 1006, 1011, 141 USPQ 245, 249 (1964). (Emphasized.)

I am informed, the Federal Circuit has endorsed this case law. For example, see Beckman Instruments, Inc. v. LKB Produkter AB, 13 USPQ2d 1301 (Fed. Cir. 1989), which states: "[i]n order to render a claimed apparatus or method obvious, the prior art must enable one skilled in the art to make and use the apparatus or method."

34. Given the foregoing, the '914 does not enable any form of battery, but capacitors only, and, further, does not enable capacitors of microscopic size. Accordingly, I believe the '914 patent should be withdrawn as a reference.

35. The '914 reference enables only macroscopic capacitors, not batteries, independent of size, and not microscopic batteries. The '914 reference provides no disclosure nor enablement of microcircuitry, including but not limited to MEMS, integrated with a microscopic battery.

36. Accordingly, the express limitations of each of the presently pending claims are not fully met nor made obvious by the '914 patent, in my opinion. As pointed out in the present

specification, no microscopic battery, including the present invention, has been provided by the prior art nor has one previously been combined as an integrated part of a microcircuit. See page 3, lines 7-8 of the present application, which states "[p]resently, none of these devices [MEMS] are using integrated batteries, because none exist, nor have they previously been invented and developed." If the '914 patent made microscopic batteries obvious and the combination of a microscopic battery and microcircuitry obvious, such would have been in place long ago, given the economic and performance advantages and the ever-growing size of the MEMS and other microcircuits market.

37. It follows the express limitations of each of the presently pending claims are not fully met by nor made obvious to one of ordinary skill in the art from either or both of the '941 references.

38. The Examiner rejected all of the elected claims, as earlier constituted, as ambiguous under 35 USC § 112, second paragraph.

39. My understanding of controlling § 112 case law is set forth below:

(a) 35 USC § 112, second paragraph, reads as follows:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

(b) I am advised, under this statute, the inventor must focus, in his or her claims, on that which constitutes his inventive contribution. If his or her invention is broad, it may be claimed in broad terms. Extraneous information, not strictly part of the invention, does not have to be recited in the claims.

(c) I am further advised that the issue presented by the Examiner in regard to § 112, second paragraph, pertains to what is sufficiently particular so as to distinctly claim the subject matter the Applicant considers to be his invention. Extensive detail is not required and broad recitations which have a substantial scope are not necessarily vague just because such limitations



would encompass more than one way of accomplishing something or a plurality of structures for accomplishing something.

(d) The basic § 112, second paragraph case law standard is set forth in Antonious v. ProGroup, Inc., 217 USPQ 875, 877 (6<sup>th</sup> Cir. 1983), which is:

The standard of definiteness is one of reasonableness under the circumstances. Charvat v. Commissioner of Patents, 503 F.2d 138, 147-51, 182 USPQ 577, 584-88 (D.C. Cir. 1974); Georgia-Pacific Corp. v. United States Plywood Corp., 258 F.2d 124, 136, 118 USPQ 122, 131-32 (2d Cir. 1958). The teachings of the prior art and the nature of the particular invention are to be considered in determining whether the claims meet the statutory requirement of definiteness and particularity. In re Moore, 439 F.2d, 1232, 1235, 169 USPQ 236, 238-29 (CCPA 1971).

(e) Reliance upon the knowledge of terms by those skilled in the art does not violate § 112. See State Industries, Inc. v. A.O. Smith Corporation, 221 USPQ 958, 975 (Tenn. Dt. Ct. 1983), which holds:

Every patent application relies to some extent on the reader's knowledge of the terms, concepts and constructions it embodies and, therefore, relies to some extent upon knowledge of persons skilled in the art to complement that disclosed in order that it be enabling within the meaning of 35 USC § 112. In re Lange, supra; In re Wiggins, 488 F.2d 538, 543, 179 USPQ 421, 424-25 (CCPA 1973); Rengo Co. Ltd. v. Molins Machine Co., Inc., 211 USPQ 303 (3d Cir. 1981).

(f) There is no fundamental ambiguity based upon the aforesaid reasonableness standard in the claims as originally submitted, as first amended, nor as presently constituted. The standard for definiteness is not only one of reasonableness under the circumstances but must take into account the teachings of the prior art and the nature of the invention at hand. See Radio Steel & Mfg. Co. v. MTD Products, Inc., 220 USPQ 35, 41 (Ohio Dt. Ct. 1983), which states:

The standard of definiteness is one of reasonableness under the circumstances, and the teachings of the prior art and the nature of the particular invention are to be considered in determining whether the claims meet the statutory requirement of definiteness and particularity. Antonious v. ProGroup, Inc., 699 F.2d 337, 217 USPQ 875 (6<sup>th</sup> Cir. 1983). (Emphasis provided.)

(g) The Federal Circuit has rejected the notion that literal support in the specification for terms which are clear is required under § 112. See In re Kaslow, 217 USPQ 1089, 1096 (CAFC 1983) which states:

The test for determining compliance with the written description requirement is whether the disclosure of the application as originally filed reasonably conveys to the artisan that the inventor had possession at that time of the later claimed subject matter, rather than the presence or absence of literal support in the specification for the claimed language. In re Edwards, 558 F.2d 1349, 196 USPQ 465 (CCPA 1978); In re Herschler, 591 F.2d 693, 200 USPQ 711 (CCPA 1979) (Emphasis supplied.)

(h) The aforesaid standard, as to claims, was repeated by the Board in Ex parte Kristensen, 10 USPQ 2d 1701, 1703 (Bd. Of Pat. Appeals and Interf. 1989), which states:

In Moore, the court held that with respect to the second paragraph of Section 112, the inquiry is "to determine whether the claims do, in fact, set out and circumscribe a particular area with a reasonable degree of precision and particularity." (Emphasis added.)

(i) The Board points out in Ex parte Adrianus P.M.M. Moelands, 3 USPQ 2d 1474, 1476 (Bd. of Pat. Appeals and Interf. 1987) that:

We will also not sustain the rejection of claims 9, 11 and 20 under 35 U.S.C. 112, second paragraph. This statutory provision merely requires that the claims set forth and circumscribe a particular area with a reasonable degree of precision and particularity. The definiteness of the claim language employed must not be analyzed in a vacuum, but always in light of the teachings of the prior art and of the particular application disclosure as it would be interpreted by one having ordinary skill in the pertinent art. In re Moore, 58 CCPA 1042, 439 F.2d 1232, 169 USPQ 236 (1971). (Emphasis supplied.)

(j) Similarly, the same standard is set forth in MPEP Section 706.03(d) which reads:

... [the Examiner] should allow claims which define the patentable novelty with a reasonable degree of particularity and distinctness. Some latitude in the manner of expression and the aptness of terms should be permitted even though the claim language is not as precise as the examiner might desire. (Emphasis provided.)

The claims as well as the specification are reasonable precise and particular, in my opinion.

(k) As stated in Railroad Dynamics, Inc. v. A. Stucki Co., 218 USPQ 618, 631

(E.D. Pa. 1983):

Finally, the fact that a claim "may be broader than the specific embodiment disclosed in a specification is in itself of no moment." [In re Rasmussen,] 650 F.2d at 1215 [211 USPQ 323 (CCPA 1981)]. The claims not the drawings, define the scope of the patent, and every conceivable embodiment need not be disclosed in the drawings, Maxon v. Maxon Construction Co., 395 F.2d 330, 334-35, 158 USPQ 77, 79-81 (6<sup>th</sup> Cir. 1968); see Continental Paper Bag Co. v. Eastern Paper Bag Co., 210 U.S. 405, 418-19 (1908).

(l) It is not necessary per se to encumber claims with detailed recitals. This is confirmed by MPEP Section 706.03(d):

The fact that a claim is broad does not necessarily justify a rejection on the ground that the claim is vague and indefinite or incomplete. . . . a claim may, in general, be drawn as broadly as permitted by the prior art.

(m) The case of Andrews Corp. v. Gabriel Electronics, Inc., 6 USPQ 2d 2010 (CAFC 1988) conclusively affirms a § 112 position that relative and somewhat imprecise phrases such as "approach each other," "close to," "substantially equal" and "closely approximate" satisfy § 112 both legally and factually where such phrases serve to distinguish the claimed invention and one of ordinary skill is able to understand the meaning thereof.

40. Based upon the foregoing, there is no prohibited ambiguity contained within the presently pending elected Claims. I believe that the presently pending elected Claims fully satisfy the statutory and case law requirements of § 112, second paragraph. Accordingly, it is respectfully requested that the § 112, second paragraph rejection be reconsidered and withdrawn or, better stated, that it not be reasserted against currently pending Claims.

41. I hereby declare that all statements made herein are of my own knowledge to be true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are

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punishable by fine or imprisonment or both under § 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

DATED this 14 day of August, 2000.

  
RODNEY M. LAFOLLETTE, PH.D.

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